

WST 212 PROJECT

An analysis of crime trends in South Africa from 2005-2015

University of Pretoria

Christiaan Lombard

U21439487

Our goal

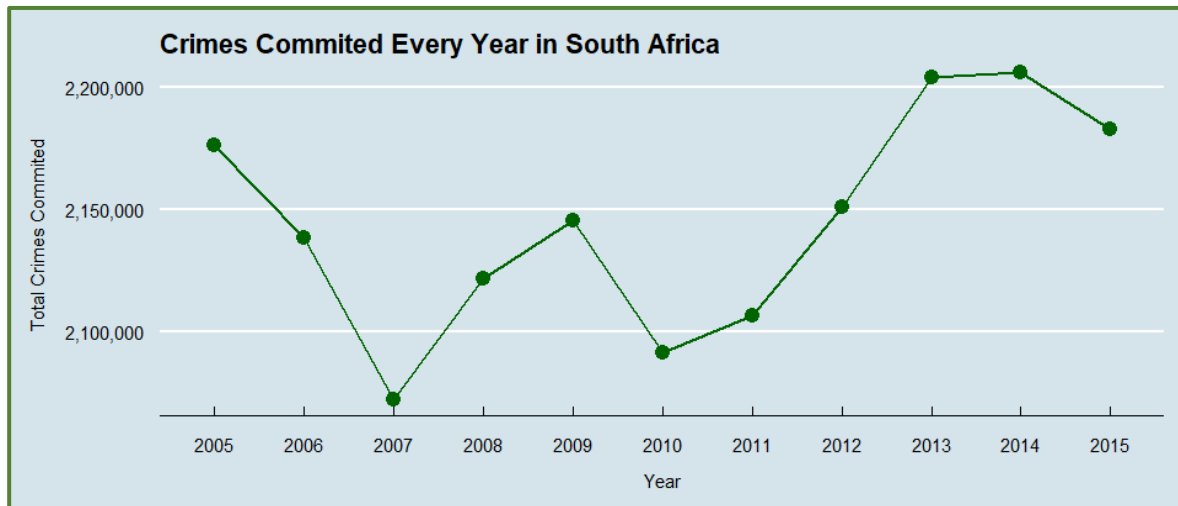
To analyse South African crime statistics for the period from 2005 to 2015, to ask important questions and make deductions based on the results.

Questions

1. How much crime is committed in South Africa?
 - a. Is it following an underlying trend?
2. How much crime is committed in each Province?
 - a. Overall crime
 - b. Per capita
3. Is there a significant correlation between population density and crime occurrence?
4. What are the trends for specific crimes?
 - a. Growth rate

Overall Crime Committed in South Africa

Modelling the crime rate for the whole of South Africa can prove to be useful, since it gives an overall idea for the state of South Africa, how crime-reduction plans are affecting the crime rate over a period and additionally, how external factors are affecting crime within the country.



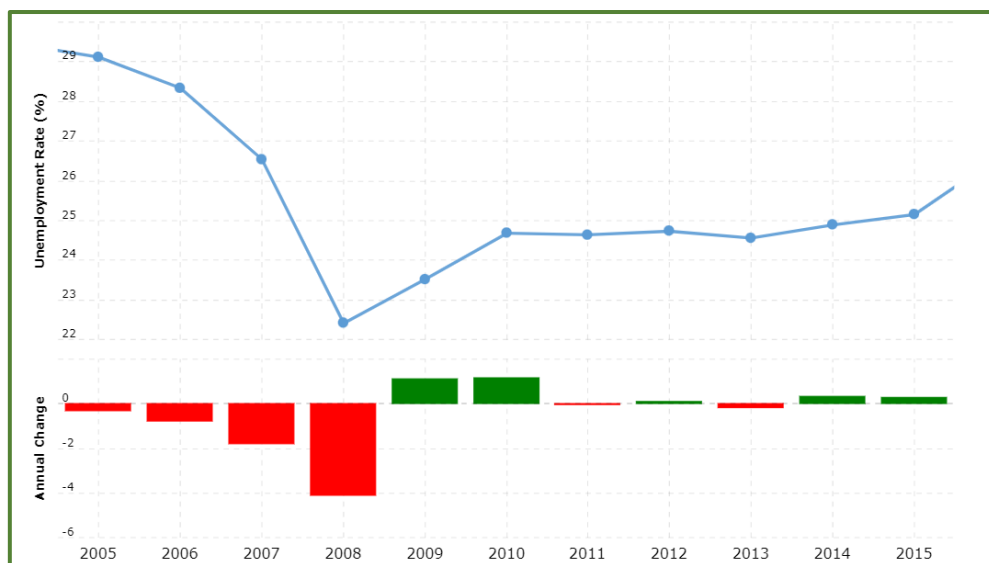
Line plot for Crimes Committed Every Year in South Africa

In the above figure, we observe a minimum of 2,072,449 reported crimes in 2007 and a maximum of 2,206,506 reported crimes in 2014. Possible explanations for the extremely high crime-rate, include poverty rates, unemployment rates and median-income.

A significant decrease in crime can be observed from 2005 to 2007, alternatively a significant increase in crime can be observed from 2010 to 2014.

An underlying trend for crime from the graph seems to be that crime is increasing, in 2014 crime was at an all-time-high, with a slight decrease in 2015. When considering external factors, such as unemployment rate, the underlying trend is unlikely to change, but keep on increasing steadily or remain high.

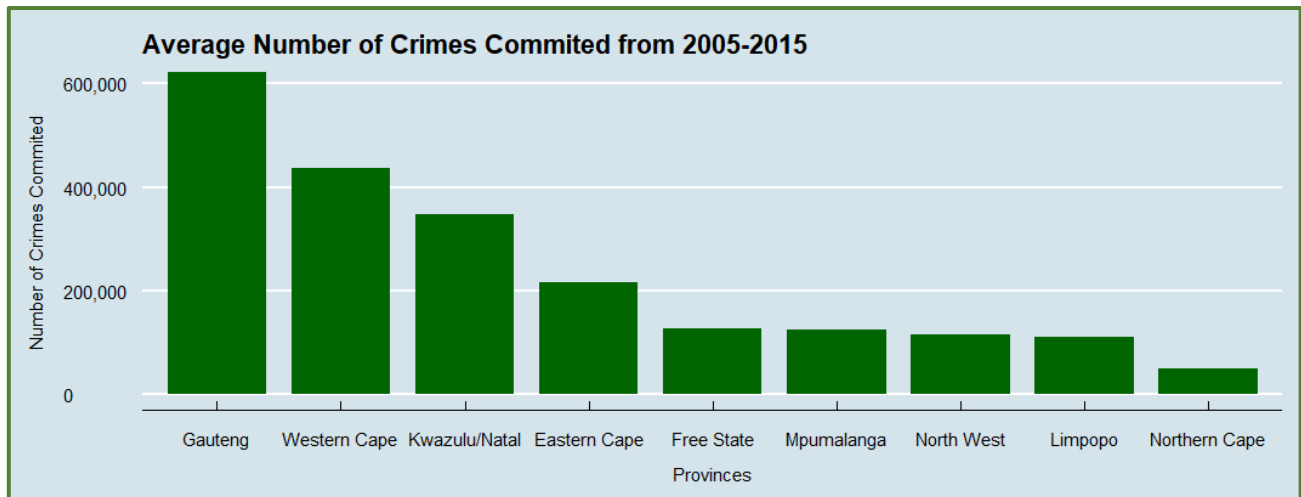
	Crimes
2005	2176557
2006	2138717
2007	2072449
2008	2121884
2009	2145388
2010	2091348
2011	2106560
2012	2151032
2013	2204000
2014	2206506
2015	2182999



South African Unemployment Rate – source: macrotrends

Crime per Province

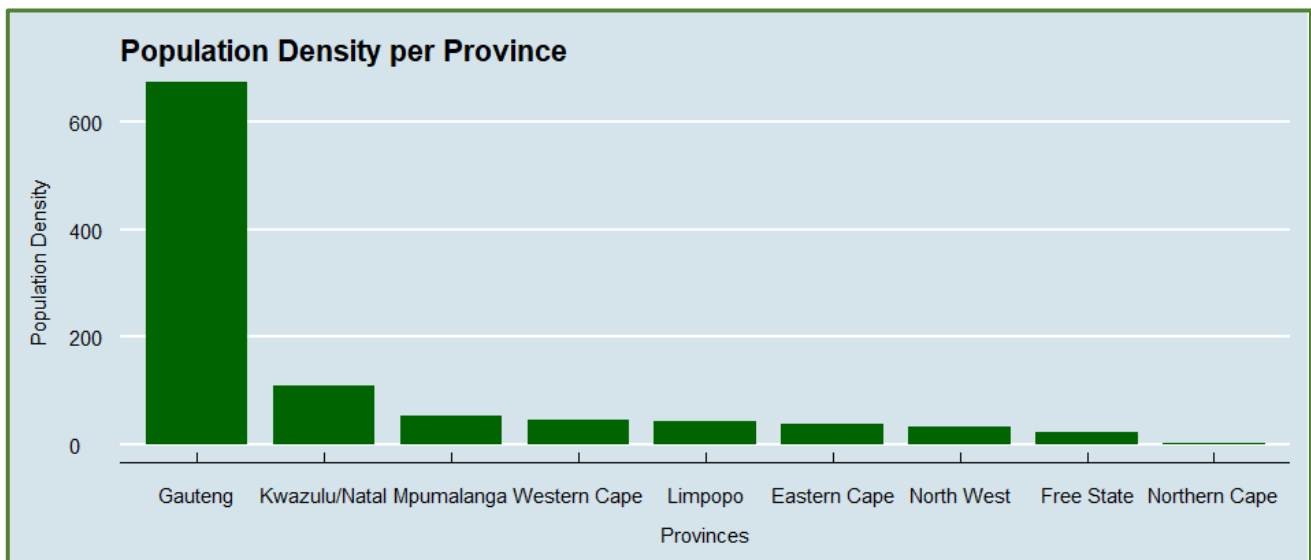
Analysis of provincial crime rates provides a more detailed insight into the state of crime in different provinces versus the crime rate for the whole country, since some provinces might have higher crime rates than others.



Bar Graph for Average Number of Crimes Committed from 2005-2015

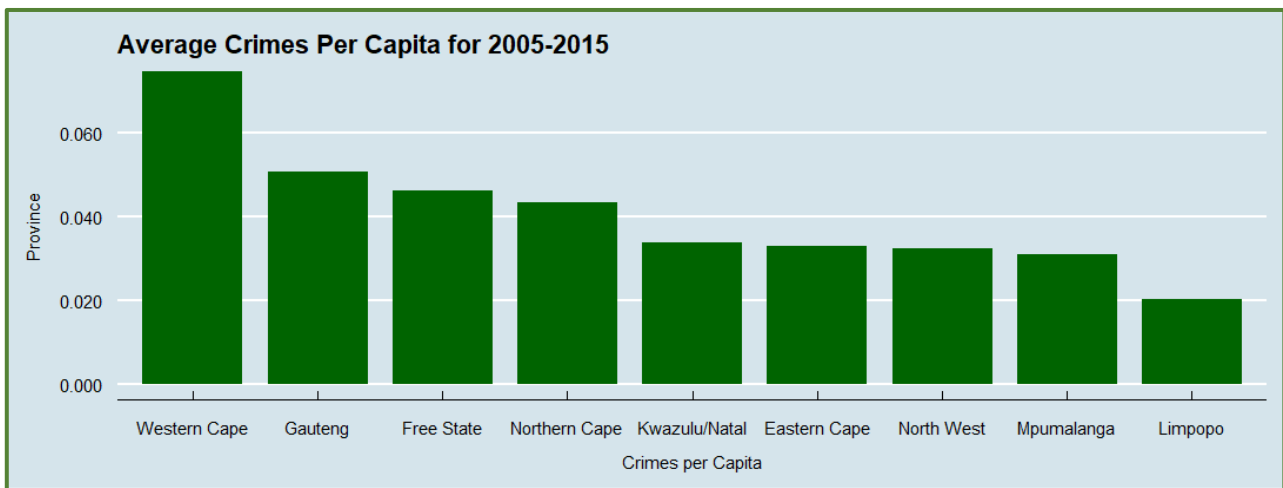
It might seem like certain provinces have disproportionate crime rates, but factors such as population and population density affect the crime rate heavily.

$$\text{Population Density} = \frac{\text{Nr. of People}}{\text{land area}}$$



Bar Graph for Population Density per Province

Upon further analysis of the population density for different provinces, one can observe that Gauteng has an extremely high relative population density, therefore a more accurate model would be to model the crime rate per capita.



Bar Graph for Average Crimes Per Capita for 2005-2015

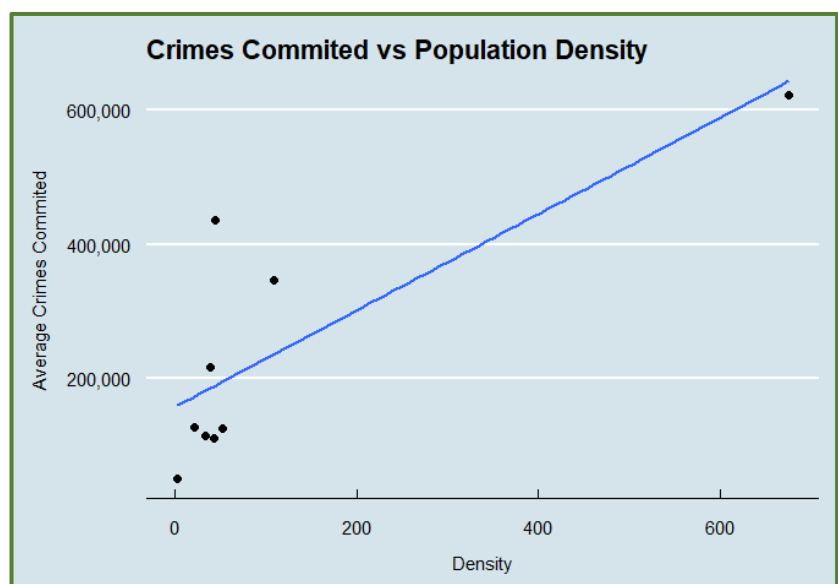
Modelling the average crime rate per capita instead of overall crimes committed yields interesting results. Upon observation Western Cape has the highest crime rate, by a fair margin (0.0748), which equates to almost 75 out of 1000 people experiencing crime. Alternatively, the rest of the provinces are in the range (0.0202 - 0.0508), which averages around 36 out of 1000 people experiencing crime. Possible explanations for the discrepancy between provinces, could be lack of police presence, lower median income and unemployment rate.

Correlation between Crimes Committed and Population Density

Correlation Coefficient:

0.8027

The correlation coefficient between crimes committed and population density reveals a fairly strong positive correlation. Unfortunately, there are very few data points to calculate the correlation coefficient, thus the coefficient is not as accurate as it could be if more data



Scatterplot for Crimes Committed vs Population Density

was available, such as the crime rate for different areas and their population density.

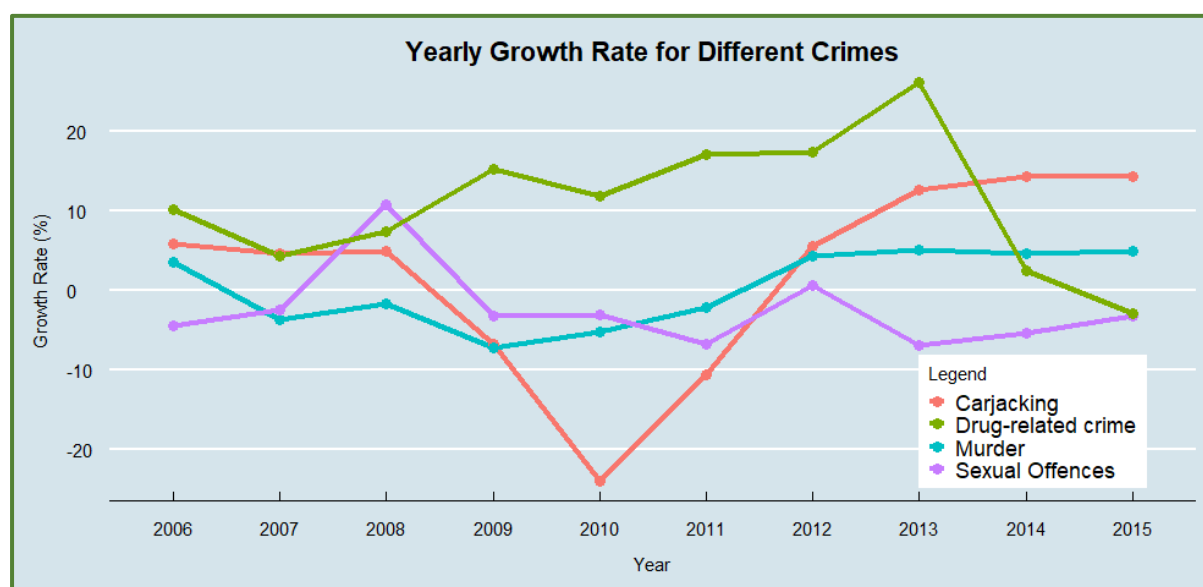
However, logically it makes sense, since a higher population density means more people in an area, which allows for more interaction and less travel time to commit crimes.

Growth Rate for Specific Crimes

An important question to ask is: “why model growth rate instead of comparing the number of crimes committed?”, simply put it’s a problem of proportion. A crime that goes from 1200 offences to 1240 offences in a year is merely a 3.33% growth, but a crime that goes from 10 offences to 40 offences is a 300% growth. Thus, modelling the growth rate gives a better indication of the trend of the crime, since a larger range shrinks changes in value.

$$\text{Growth Rate} = \frac{\text{Present Value} - \text{Past Value}}{\text{Past Value}} * 100$$

We will observe the growth rate for four different crimes: carjacking, murder, sexual offences, drug-related crime.



Line plot for Crime Growth Rate from 2005-2015

Drug-related crime immediately stands out as it has been growing increasingly every year, until 2015, when it had a negative growth rate for the first time. This does not necessarily represent an increase in drug-crime but could rather hint to police-crackdown on drugs being effective at catching perpetrators but not stopping them.

Sexual offences had an impressive negative growth rate for all years, except 2008 and 2012, which can be explained by cultural norms evolving and movements such as #MeToo, which advocates against sexual crimes against women.

Murder had a near-constant negative growth from 2007-2011, but afterwards can be seen to be growing steadily every year.

Carjacking had a significant negative growth in 2010 but stabilized back to its normal growth rate afterwards.

References

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